

HIGH POWER MICROWAVE (HPM) SUPPORT STATEMENT OF WORK

1.0 SCOPE:

This work assignment order (WAO) is executed to provide research support services and materials to the U.S. Army Research Laboratory (ARL), Survivability/Lethality Assessment Directorate (SLAD), Electronic Warfare Division (EWD), High Power Microwave (HPM) project. Research services and materials are required to support HPM, and Narrow Pulsed, Impulse Environment (NPIC) phenomenology and hardening investigations being conducted by EWD. The requirements for implementation of standard and unique techniques in susceptibility measurements, microwave coupling, electromagnetic (EM) generation, circuit/system analysis, and field investigations are outlined in paragraph 3.

2.0 APPLICABLE DOCUMENTS:

WSMR PD 2348C-93

2.1 Background Information. EWD is responsible for the coordination and execution of the Special Electromagnetic Interference (SEMI) program as part of the U.S. Army Electronic Warfare Vulnerability Assessment (EWVA) program. These responsibilities include HPM, and specifically vulnerability assessments, which are a natural extension of SEMI. To fulfill the U.S. Army HPM and NPIC requirements, EWD will utilize the Electromagnetic Analysis Facility (EMAF), and various HPM and NPIC facilities throughout the CONUS and the United Kingdom.

3.0 TECHNICAL REQUIREMENTS:

3.1 The contractor shall provide the following on-site research support services at the EMAF to fulfill U.S. Army HPM and NPIC requirements:

3.1.1 Perform power density or field intensity measurements and analysis of EM environments during low power microwave (LPM), HPM, and NPIC investigation phases.

3.1.2 Perform radio frequency (RF) microwave coupling analysis of systems undergoing HPM and NPIC investigations. Laboratory, anechoic chamber, and field experiments shall be utilized to verify predicted results.

3.1.3 Provide investigative support at the EMAF and at selected field sites where HPM and NPIC experiments are to be performed. The support shall include:

3.1.3.1 Power density or field intensity measurements of the HPM or NPIE environment.

3.1.3.2 Preparation and checkout of the system under investigation, to include telemetry and special purpose instrumentation.

3.1.3.3 Field diagnostics of HPM or NPIE induced effects observed during the investigations.

3.1.3.4 Detailed electronic circuit and component diagnostics, and documentation of HPM or NPIE related effects.

3.2 The contractor shall utilize government materials to the extent that the Government can provide. When materials cannot be provided by the Government, the contractor shall provide:

3.2.1 Machine shop labor and materials to support HPM and NPIE investigations.

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3.3 To ensure the most effective use of EWD resources in accomplishing specific HPM and NPIE tasks, the contractor shall apply background and experience in EMP, SEMI, HPM, and NPIE effects on Army weapon systems. The contractor shall perform scientific, engineering, and analytical work supporting the EWD HPM and NPIE vulnerability assessments. To do this the contractor shall:

3.3.1 Develop ECCM investigation plans for evaluation of hardening techniques for protection of U.S. weapon systems and sensors from SEMI and HPM environments.

3.3.2 Conduct ECCM measurements to evaluate the effectiveness of hardening weapon systems at White Sands Missile Range (WSMR), NM, and/or other facilities where required HPM environments can be generated.

3.3.3 Analyze laboratory and field investigation data to determine system susceptibility characteristics and the effectiveness of hardening techniques.

3.3.4 Monitor nonlinear optical material research and development programs in DoD, industry, and universities for application to EM field sensing and nuclear/laser hardening of sensors. Recommend the most promising materials and optical switch techniques for Army applications.

3.3.5 Conduct ECCM measurements to evaluate the shielding effectiveness of hardened missile domes and optical windows to SEMI/HPM

environments.

3.4 The Government will provide office space, desks, and chairs in the EMAF. Electronic test equipment, laboratory space, and other facilities will be provided to the contractor on a shared basis with government personnel.

3.5 HPM, NPIE investigations and technical meetings are to be conducted at various locations throughout CONUS. It is estimated that the HPM and NPIE investigations will require a minimum of two and a maximum of three trips as delineated below:

3.5.1 Three persons for five days to Los Alamos, NM and Huntsville, AL.

3.5.2 In addition it is estimated that one electronics engineer/physicist will be required to travel for five days to participate in a technical meeting and/or symposia to Washington, DC.

3.6 Documentation:

3.6.1 Interim Technical Reports - The contractor shall submit one draft copy 30 days after completion of the following tasks:

3.6.1.1 RF/microwave coupling, analyses, electronic circuit/component diagnostic efforts, HPM or NPIE related effects, and EM hardening (ECCM) efforts.

3.6.2 Final Technical Reports - The contractor shall submit a final technical report for each task 30 days after completion of interim technical reports.

3.6.3 Project Status Report - The contractor shall submit monthly project status reports.

4.0 DELIVERABLES, SCHEDULES, AND DATA ITEMS:

4.1 Start date: DOA.

4.2 End of technical effort: January 31, 1997.

4.3 End of work: January 31, 1997.

4.4 Final report: 30 days after completion of technical effort.

4.5 The following contract report requirements are applicable: T-002, T-003, T-004.

Contract DAAD07-93-C-0125

WAO TSA-22: High Power Microwave (HPM) Support

TECHNICAL RESPONSE

NMSU/PSL agrees to provide research support services to the U.S. Army Research Laboratory (ARL), Survivability/Lethality Assessment Directorate (SLAD), Electronic Warfare Division (EWD), High Power Microwave (HPM) project.

This support will include performance of power density/field intensity measurements; characterization and analysis of EM environments during the various investigative phases.

We agree to perform microwave coupling analysis of systems during HPM and NPIE investigations. The results of the LPM investigations in the anechoic chamber will be used to predict HPM/NPIE results; field experiments will be used to verify the predictions.

All of the support requirements in the conduct of the HPM/NPIE field investigations will be provided. Some of these functions are: i) insuring proper system operation and baselining of the telemetered functions; ii) post mortem, circuit and component diagnostics related to HPM/NPIE effects; iii) field diagnostics of the environment for the HPM/NPIE induced effects during the investigation.

NMSU/PSL will use the experience gained in SEMI, HPM and NPIE investigations on Army weapon systems to provide analytical and engineering support. This support includes developing ECCM investigation plans to determine system susceptibility characteristics, conduct ECCM measurements to evaluate effectiveness of hardening techniques such as hardened domes and coated optical windows.

When tasked, NMSU/PSL will investigate pertinent research of optical material and development programs pursued by DOD, industries and universities; also participate in technical conferences, meetings, and seminars to promote technology transfer in the HPM/NPIE community.

NMSU/PSL has an extensive machine shop that can provide support as required by 3.2.1 of the SOW. The machine shop support will be provided on an as-needed basis. For budgetary purposes the number of machine shop hours was estimated.

A period of performance through 28 February 1997 is requested to allow completion of the final report.